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RECENT IMPROVEMENTS IN PHOTOGRAPHY.

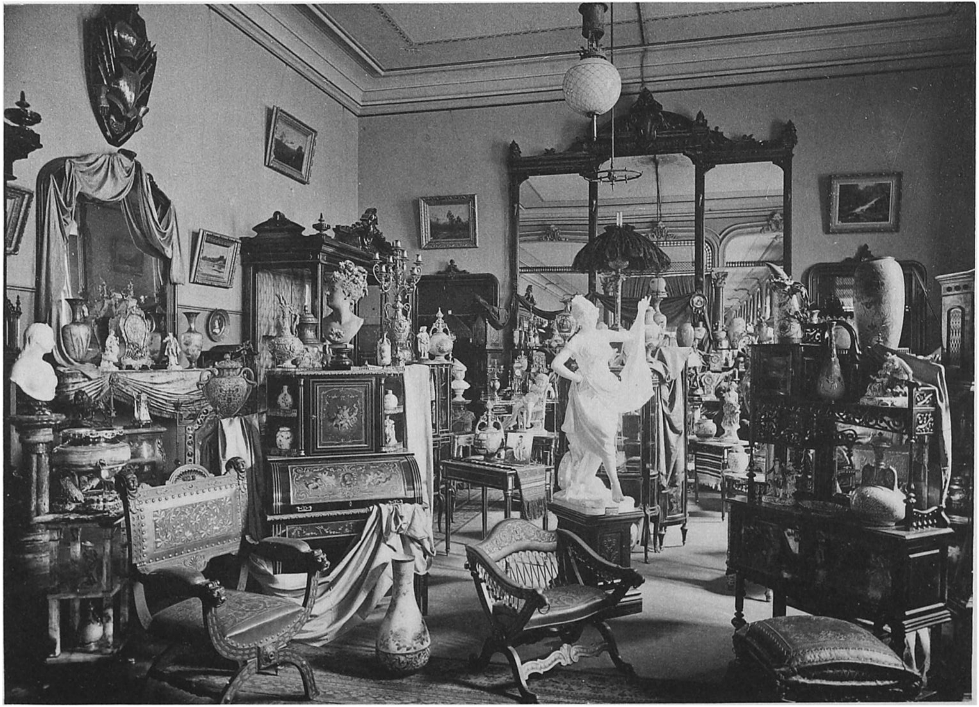
BY G. VAN MUYDEN.

ANY one who, like the author, can remember the beginning of the art of taking daguerrotypes and of photography, and compare the results now obtained by the camera, is astounded at the enormous progress in the short space of time. Talbot and his countless disciples soon succeeded in producing portraits free from blemishes, and impressions of inanimate objects, as well as reproductions of pictures, drawings, etc.; but they failed for a long time in producing any certain results in the management of moving objects, since the exposure of the plate was too tedious a process, and they had no instruments suitable for the purpose. Also we did not then have the experience now so wide-spread of the reproduction of photographic impressions by lithography or the printing-press, so that photographs remained expensive, and Talbot's art played but an unimportant rôle in the ornamentation of fine works or as a substitute for the tedious and not always correct work of the designer and wood-engraver.

All this was suddenly changed. The production of illustrated works and papers by the help of different photographic processes became so much easier and cheaper that they are now almost the rule, while upon the other hand we possess the means of catching motions upon the easily-affected plate more correctly than the human eye, perfect as it is, can seize them. In a word, the so-called instantaneous photography, and photographic reproductions, have already acquired an importance which a few years ago no one could have dreamed was possible, and they have become aids that cannot be spared both to the scientist and to the artist.

We will first begin at the beginning, and then cast a glance upon the employment of photography in the science of astronomy, and consider its value to the book-trade, concluding with a short survey of its future.

Instantaneous photography dates from the day when the English physician Maddox, in the year 1871, succeeded in replacing collodion by gelatine, whose susceptibility to light is twenty times greater than that of the old plates, and which, besides, possesses the invaluable advantage that months can pass between receiving the impression and reproducing it. By its aid were the photographs of travel, the impressions of things seen by scientific travellers, soldiers, or artists, first made possible; for it can be seen at a glance that so long as a studio with a dark room must be carried along there would be no pictures taken in the open air. The improvement of the apparatus had great influence upon the progress of instanta-



MESSRS. BAILEY, BANKS & BIDDLE'S ART ROOM.—SEASON OF 1888–89.

neous photography as well as the so-called confinement,—that is, the contrivance which enabled the operator after exposing the plate to the light to shut it again. For this purpose compressed air has been chiefly used, and latterly the more quickly acting electricity has been employed with great success.

And now a word upon the travelling photographic apparatus, whose number is already legion. Of course it is desirable to avoid weight, and to have it in a form as easy as possible to carry. They can be divided into two classes. There are cameras which remind one of the well-known contrivance in the photograph-gallery, and are either provided with a foot, like the travelling camera of Schröder of Berlin, or like Talbot's of Berlin, which requires only the arm and hand as a prop in taking the picture. The apparatus of Enjalbert of Paris is in the form of a revolver, which certainly possesses the disadvantage that any one upon whom it is levelled considers it a weapon and fancies it has designs upon his life. The far more perfect photographic instrument of the French Academician Marey, which is mostly used in taking birds upon the wing, has the same fault. The still better photographic gun of Fol of Geneva is wrongly named. It can scarcely be distinguished from the momentograph, and produces considerably larger pictures. This instrument contains a number of plates which appear one after the other behind the object and again disappear. The photographer accomplishes this change of plates by pressing upon a spring, or it is done by clock-work. The latter method is necessary when impressions of the same object quickly succeeding one another are desired, as, for example, the movements of birds in flying.

There is also a camera in the shape of an opera-glass. The one tube serves to aim, the other holds the plate. Such a glass can photograph without attracting attention, and is useful to police-officers, reporters, etc. It has this disadvantage, however, that the very small plates must be made larger before they can be used.

The detective camera is also interesting. It is an instrument for photographing criminals without their knowledge. The secret police use it for many purposes, and a Paris bank photographs people entirely unseen who act suspiciously in selling commercial paper or changing bank-notes.

We spoke above of the inconceivably short period of exposure which is necessary in instantaneous photography. Naturally the time depends somewhat upon the object. In his excellent hand-book of instantaneous photography Eder gives the following results:

Laughing children .	$\frac{1}{5}$	to	1	second.
Street scenes . . .	$\frac{1}{20}$	to	$\frac{1}{50}$	"
Ships sailing near by .	$\frac{1}{50}$	to	$\frac{1}{150}$	"
Running horses, flying birds, running trains	$\frac{1}{100}$	to	$\frac{1}{1000}$	"

By the last process of $\frac{1}{1000}$ of a second only outlines or silhouettes of the objects are secured,—black upon white, or *vice versa*. But these suffice for scientific purposes

Of what use has instantaneous photography been? To answer this question exhaustively would take more room than we have at our command. We must, therefore, content ourselves with some important instances of its use.

It is remarkable that instantaneous photography has been so little used in the studios in taking portraits, for here it would be truly in place. How many people dislike to be photographed simply because they cannot attain the absolute immobility required, because the few seconds which the taking by the usual process requires seem like so many hours, because their nerves cannot stand the strain. These people would be helped by the quick process. The pictures would also gain in naturalness, and the classic "pleasant expression" would oftener be met with. Talbot has succeeded in making excellent instantaneous pictures of laughing, crying, and playing children, an undertaking not so easy as one might imagine. Above all things, the photographer must arm himself with patience; he must not make the children shy; on the contrary, he must make friends with them. For instance, the child is put upon a table or in a little wagon; it is then useful to operate with a plaything which it hears but does not see, a music-box for example, which attracts its attention and for a few seconds at least keeps it motionless. The best pictures of children are by Boissonaz of Geneva. Laughing adults, according to Eder, have been best done by Falk of New York.

In the good old days the photographer who wished to take views of streets or places selected the earliest morning hours, the time when no one was visible, so that the pictures produced the impression of a second Pompeii. With the discovery of dry-plates there was an improvement, and we now have numerous pictures which show cities full of life and action. At the same time the photographer encounters great difficulties, chiefly because he does not know exactly where to place his apparatus and is surrounded by a gaping crowd of troublesome spectators. We have not been entirely satisfied with any results that we have yet seen: they are all somewhat blurred and inartistic.

On the other hand, we have excellent pictures of ships and yachts gliding along water lightly in motion. The yachts Lorna and Marguerite were admirably photographed by West & Son of Gosport. The sea-pictures by R. Wight of Charlottenburg are quite as good, as are also their photographs of Rhine steamers. In these pictures the water is only slightly agitated. Taking a strong sea is more difficult, because waves agitated by a high wind possess a faculty of disappearing. We have as yet seen no good photographs of this kind. Moving ships or boats are not easy to take. A short time since we had our yacht under full sail taken by Theile of Charlottenburg. Although we selected a day when the wind was very light and the boat therefore moved but little, it required half a dozen attempts before the photographer secured a satisfactory picture.

In England attempts have been made to take pictures from ships. If the sea is not perfectly quiet it is very difficult to get the picture in the proper place upon the plate. For this purpose a camera is used hung after the manner of a ship's compass. Related to these are pictures taken from a balloon. Sanguine people have great hopes of these pictures, and think that they will assist the work of the engineer and render it easy to take pictures of places and fortresses in the hands of the enemy; but the main point is lacking,—the existence of a manageable balloon. The pictures taken from above, which we have seen, lack the necessary clearness: they look like black blurs.

The photographs of moving trains of cars are better, though it must be difficult to succeed with them. If we grant that the exposure lasts $\frac{1}{5000}$ of a second, a fast train which moves seventy-five kilometres an hour moves four centimetres forward in this incredibly short time, and that is enough to blot out many details, such as the spokes of the wheels and the working parts of the machinery. The result is rather thankless, since the train seems to stand still, and only the smoke shows that the object is a moving one. Impressions taken from a moving train have never succeeded, owing to the motion of the coaches

Instantaneous photography has already rendered great service to astronomy. It was used in 1885 in Berlin to take observations upon some falling stars,—an extremely difficult experiment, since the phenomena lasted at most two seconds, and their light was very weak. Two instruments were placed several kilometres apart, and the track of the falling stars was determined by a comparison of the two plates thus obtained.

The pictures which show the results of blowing up the rocks at Hell-Gate, New York, are also very interesting. The force of the gases hurled the water two hundred feet above the shattered rock, and the photographer succeeded in fixing an impression of the mighty column of water at its highest point. The pictures recall drawings of floating icebergs. Professor Mach of Prague succeeded after many trials in photographing a pistol-ball in motion; but in order to do this he had to proceed in quite a different manner from the usual way. He worked in an entirely dark room, the lens of the apparatus remained open, and the ball the moment when it flew by was lighted by an electric spark.

The photographing of lightning and by an electric machine is more important. An Austrian photographer, R. Haensel of Reichenberg, first succeeded in this, and later Dr. Kayser in Berlin. These impressions are worthy of mention. The lightning apparently describes a zigzag course in descending; in reality it does not. Lightning makes a serpentine line, like the course of a river, and sends from all sides branches which divide again into smaller ones and at length disappear. Also, lightning consists, except for the ramifications, of not one but four parallel rays, which are divided by dark spaces between. The experiment resembles those of Mach in that it must be attempted in a dark room. When an electric spark strikes a metal plate it immediately bursts asunder, and the smallest lines are pictured.

We now come to the most interesting use of instantaneous photography, —the taking of animals in rapid movement. It is a pity that the number of pictures is already so great that we must limit ourselves to the consideration of the most perfect, and, indeed, entirely to the photographs of galloping horses and flying storks. We have to thank Eadweard Muvbridge of San

Francisco (now of Philadelphia) for the first systematic photographing of animals in motion; this was his method: he had a horse trot and gallop upon a race-course before a row of thirty automatically-acting instruments with dry plates; the confinement was effected by electricity; the taking required but one second and $\frac{1}{1000}$; the time of exposure was $\frac{1}{1000}$ of a second. In this manner Muybridge procured illustrations of trot and gallop which as utterly overturned all former representations as did later experiments the old ideas of lightning.

Much better and stronger are the impressions of galloping horses which *La Nature* has recently published, as well as the work of Anschütz.* We have not only shadowy sketches, but veritable works of art, whose clearness is so much more worthy of recognition since the exposure was so long, and the horses moved their limbs, according to a positive calculation, at least fifty metres in a second. From this experiment, as from the pictures of Muybridge and others, it is clear that the old method of representing galloping horses is entirely incorrect. Horses extend their limbs only moderately in the fastest gallop, and whoever looks at these pictures without knowing that the horses were taken at their most rapid gait would certainly think that they were trotting along quite at their ease.

We are unquestionably under obligations to Anschütz, whom we have mentioned before, for the best pictures of animals in motion. His pictures of storks are also celebrated, and in taking them he has overcome great difficulties. The stork is very active and flies very fast; besides, he always makes his nest in high trees or upon roofs, and it was no trifle to get the apparatus high enough to seize upon the habits of the birds in their nests. The storks were afraid of the unaccustomed object, and in order to succeed in taking them Anschütz built a hut of foliage and concealed an apparatus in it, behind a stuffed figure. By and by the family of storks became accustomed to the sight, and the photographing could proceed. These pictures gave excellent results, not only of the motions of birds in flying, but of their life in the nest, the feeding and drinking of the young, their attempts to fly, their practice in rattling their bills, and the way in which the young watched the flying of the parent birds.

We have excellent pictures of running and jumping men by Muybridge, as well as by Lugardon of Geneva, Marey of Paris, and Anschütz. As an illustration of the skill of the latter, it is stated that he photographed a man nine times while he was jumping over a barrier.†

We come now to the uses of the dark camera, by which it is not necessary to take quickly-moving objects, but where the instrument plays the part of a telescope, and reproduces things which the naked eye or even the best telescope cannot see. Here the chief point is not the speed in taking the impression, but the quality of the instrument and plates. The service of photographing the stars we owe to the Paris astronomer Janssen, as well as to the brothers Henry. The apparatus used by the latter was borrowed from Gautier, and consists of two parallel tubes. One tube is a powerful telescope, and serves to search the part of the heavens to be photographed; the other contains a "photographic objective" of thirty-four centimetres' diameter. Clock-work is used, that the whole may follow the apparent motion of the stars.

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*We presume the author had not seen the latest work of Muybridge, which is also much better and stronger than that previously done by him.—[Ed. CONNOISSEUR.]

†Anschütz, it is said, has succeeded in preparing photographic plates so sensitive that an exposure of $\frac{1}{5000}$ of a second is sufficient. A very small lens must be used, so that the pictures are generally only seven-sixteenths of an inch in length and breadth. Enlarged to an inch and a half on glass plates and rotated in series of twenty-four before a Geissler tube, the pictures are used for reproducing the motions of an animal on a large screen.—[Ed. CONNOISSEUR.]

With this apparatus stars were taken which the best telescope had not discovered, and which were therefore invisible to the human eye. Photography has opened to us an entirely unknown world. The taking of previously undiscovered suns requires at least an hour, certain nebulæ two hours, while the exposure in taking Sirius is only $\frac{5}{1000}$ of a second. The rays of these stars affect the plate one million four hundred and forty-four thousand times more strongly than the nebulæ. So great is the difference in the power of heavenly bodies!

There are already thousands of photographs of the stars, and it is hoped that with the assistance of the great observatories of the world by and by we shall have photographs of the whole heavens. There has also been a beginning made with the spots upon the sun. These undertakings also prove that the easily-affected plates bring much more to light than the best telescope.

In the same category belongs the work lately undertaken by Langlois, of photographing the many inaccessible parts of mines. It was useful in quieting the relatives of those buried in the Chancelade mine, and in proving to them that their loved ones had long since ceased to suffer. To dig a shaft that men could descend would have taken months, and required large sums of money; a shaft thirty centimetres in diameter and seventy metres deep was made. In order to photograph the place in which the twelve mountaineers lay, an apparatus was sunk in the shaft which could be turned in all directions by means of ropes upon the surface of the earth. The frame of the apparatus had a number of electric lamps, which were also lighted from above. The pictures which they secured showed the condition of the ruined chamber, as well as the face of one of the unfortunate men; the others lay buried under the stones.

How does it stand with photography in natural colors, which was for a long time considered an unattainable idea? We have not progressed very far. Professor Vogel of Berlin, who has experimented most thoroughly with colors, and who already claims to have made some progress, still lives, and, as we understand from late advices, confidently hopes that "we are slowly but surely approaching the truth, and that in time it will be possible by united effort to reach the mark and to photograph in natural colors: when we have attained this, the wish that is now cherished by thousands will be fulfilled, and photography can develop on a great scale its blessed activity in the interest of art, science, and industry."*

In conclusion, a few remarks upon the uses of photography in illustrating books and newspapers. For a long time wood-engraving had this field all to itself. It had, however, two defects: the length of time required to produce it, which had as a result that the illustrated papers, such of them as aimed to present the history of the day to their readers, were too far behind the events, a serious fault in our rapid times; then they did not correctly reproduce the original drawings, a defect that naturally gave dissatisfaction to the artist. The faults gave rise to the discovery of several processes for printing photographic pictures upon stone, glass, or metal. The use of photographic pictures for the printing-press, called phototypes, is due to the discoveries of Angerer and Gosche in Vienna and Meisenbach in Munich, and has made rapid progress, as our readers can see by a glance at the great illustrated papers. They can easily distinguish these pictures by a certain beautiful softness, as well as by noting that the surface looks like fine linen. Photography will not entirely supplant the noble art of wood-engraving; it makes possible, however, the rapid production of illustrations, and perhaps in time will be used altogether by the daily newspaper.

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*A system of photographing in colors said to have been recently perfected by a London photographer is described as follows: Negatives are taken on a specially sensitized plate; from this a positive is produced on a chemically treated basis by the aid of a solar camera and a spectroscopic arrangement. The image is produced in colors on the basis without the aid of hand-work or brush. The colors are all hydrocarbons specially prepared and capable of subdivision to the 180-millionth of an inch. When the colored picture is produced by chemical action, the image exists between two films not more than one-hundredth of an inch in thickness. These photographs are said to be permanent and not affected by climate.—[Ed. Connoisseur.]